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RANGE RESOURCES AND MANAGEMENT PROBLEMS IN NORTHERN IDAHO AND NORTHEASTERN WASHINGTON

by

WALTER F. MUEGGLER

DIVISION OF RANGE MANAGEMENT RESEARCH

INTERMOUNTAIN FOREST & RANGE EXPERIMENT STATION
FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE
OGDEN, UTAH
JOSEPH F. PECHANEC, DIRECTOR

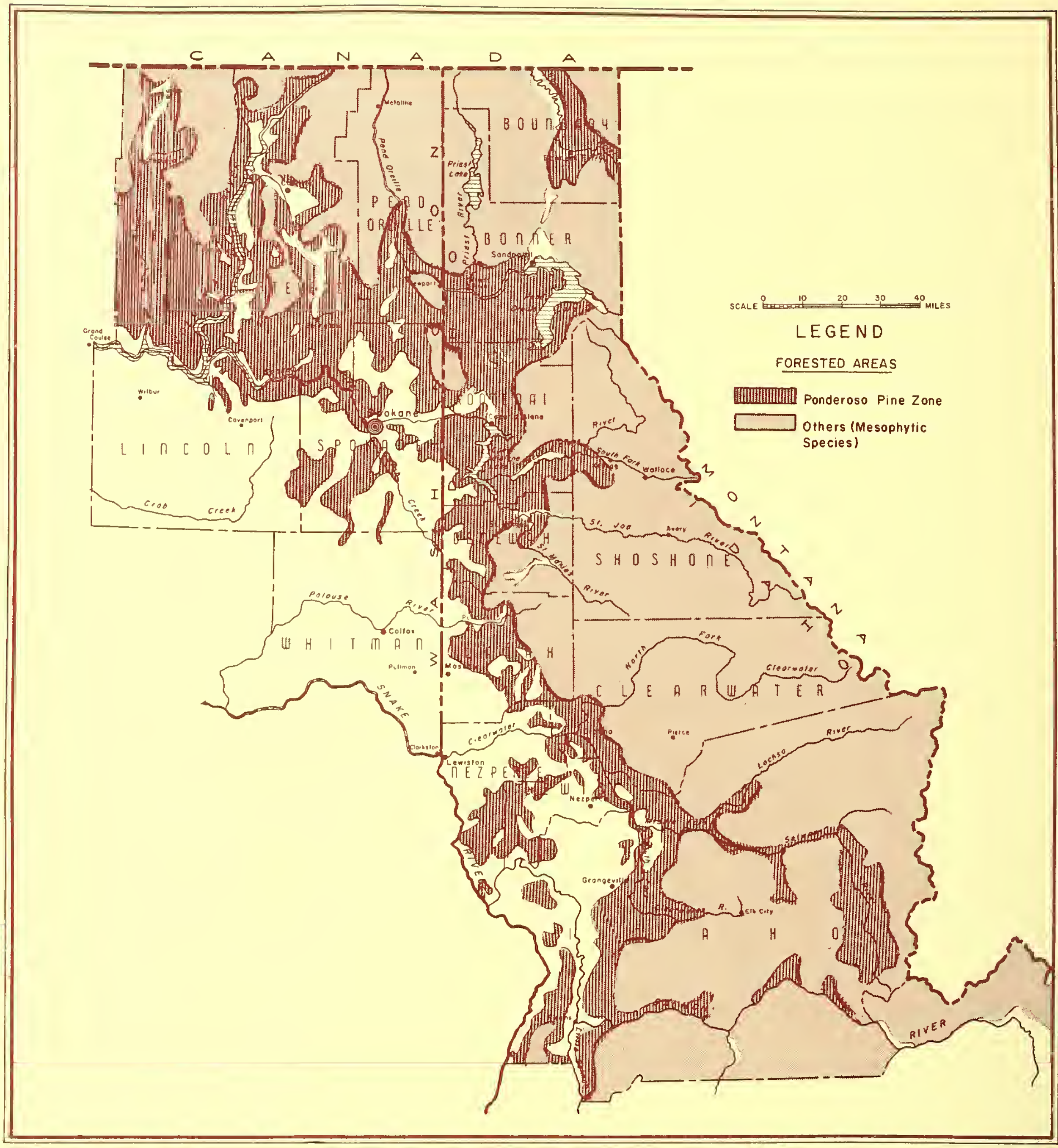

Figure 1.--Map of northern Idaho and northeastern Washington.

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INTRODUCTION

The area encompassed by this report includes the six counties of northeastern Washington and ten counties of northern Idaho (fig. 1), for a total of 20.58 million acres. A little less than two-thirds of this is in northern Idaho (table 1). The importance of the grazing resource in this area can be obscured easily by the overshadowing dominance of timber values. Approximately 70 percent is covered by forest, and wood processing is a major industry. Nevertheless, forage utilization by both domestic livestock and big game is an integral part of the economy.

The area supports more than 350,000 cattle and 65,000 sheep (table 2). Estimated valuation of all livestock in 1954 was 38¼ million dollars (table 3). Big-game animals contribute much more to the economy here than in many other areas in the West. Approximately 23,000 deer and 7,000 elk are harvested annually (table 4). The dollar value of this big-game resource has never been accurately determined, but a conservative estimate by the author places annual hunter expenditures in recent years at more than 6 million dollars. This figure does not consider the many intangible big-game values such as recreational pleasures obtained by the nonhunters who use this resource. Both livestock numbers and big-game harvest have varied considerably. However, the trend appears to be upward, and the demand upon the forage resource is likely to increase. This appears especially true for big game because of increased recreational pressures.

The contribution of livestock and big game to the economy of northern Idaho and northeastern Washington has entailed certain costs. Both livestock and big-game range have suffered varying degrees of depletion, primarily because many livestock operators and big-game managers do not thoroughly understand relations between animals and vegetation. They did not recognize the limited grazing capacity of the range, and grazing management systems for sustained forage production were practically nonexistent. Part of the resulting depletion can be attributed also to failure to apply knowledge that was available. As a consequence, large areas of formerly productive bunchgrass range have undergone type conversion to low-producing annuals; many once luxuriant subalpine herblands are now actively eroding; and numerous examples can be seen of abuse of winter range for deer and elk.

Despite the present impoverishment of large portions of the area's range lands, there is still potential for substantial livestock and big game production. A large livestock industry can be maintained by a combination of range improvement and development of grazing on forested lands. Values of

the big-game resource are just beginning to be realized. The great potential for big-game production on a sustained yield basis can be achieved by development of methods for habitat manipulation and for control of animal distributions. Research provides the key to forage improvement on depleted areas as well as for integrated and full use of the grazing resource.

Production of livestock and big game in northern Idaho and northeastern Washington depends upon highly diverse grazing lands. These vary from open low-elevation grasslands to both permanent and transitory forest ranges, to mountain meadows and subalpine herblands. Each of these broad types presents peculiar problems in grazing management. Most involve serious multiple-use considerations. All demand attention if their full grazing potential is to be achieved.

GRAZING TYPES

Open low-elevation grasslands are the traditional livestock ranges of this area. They have been subjected to grazing pressures ever since early settlement, which began about 1860. The effect of this prolonged use is shown in the present depleted condition of much of the range. Two-thirds of the most productive native grassland has been converted to cultivated farming, largely to production of wheat in the noted Palouse region. The remaining grasslands make up 10 percent of the total land area and 27 percent of the total area grazed (table 5). They are used primarily for fall-winter-spring grazing. Livestock grazing is the principal use, and no serious multiple-use conflicts are involved.

Permanent forest range, as used here, applies primarily to the relatively open ponderosa pine[1/] type. This type can support a good understory of herbaceous and shrubby species even under a mature timber stand; consequently, a permanent forage supply is possible on any given area. This is in distinct contrast to conditions in the more moist forest types.

The ponderosa pine type occupies approximately one-fourth of the total forested lands in northern Idaho and northeastern Washington (fig. 1). The bulk of forest grazing has occurred on this type. These ranges are grazed by livestock during spring, summer, and fall. Heavy indiscriminate use has left much of the permanent forest range in relatively poor condition. Large numbers of deer live here and occasionally face critical shortages of winter browse. Timber and watershed values also must be considered in resource management for these lands. Grazing, therefore, must be integrated with management for these other valuable land uses.

1/ Scientific names for all species mentioned in this report are listed in the Appendix.

Transitory forest ranges occur in the more dense western white pine, Douglas-fir, and associated forest types. These types provide grazing only where the dense tree cover has been opened by logging or fire. They generally produce abundant forage for a number of years prior to closing of the regenerated tree stand. Since very little palatable herbage is produced under a closed canopy, the forage resource in any one place is temporary or transitory.

These dense timber types make up the bulk of the forest in northern Idaho. The white pine type alone occupies more than one-fifth of the total forested land in northern Idaho and northeastern Washington. Such forest types are suitable for livestock grazing only during the summer and early fall months. Generally, livestock use has been comparatively light and sporadic. It appears that a much greater grazing potential exists here than is currently being utilized. Logging continually brings new areas into forage production as tree reproduction crowds out desirable forage on other areas; thus, this transitory range type can be considered a permanent grazing resource. However, timber and watershed values are even greater here than in the drier ponderosa pine type.

Certain portions of transitory forest ranges have special importance for maintaining the large herds of elk and deer in northern Idaho. These areas often receive year-round use by big game, and they are vital as a source of browse. Restricted wintering areas are the limiting factor in determining animal numbers. Some of these wintering areas are badly abused. Continued existence of this important big-game resource depends upon maintenance of desirable habitat in an area where natural plant succession is toward a dense tree stand--an unproductive big-game habitat. Continued production of big game, like production of livestock, will require integration with other important forest uses.

Mountain meadows are scattered throughout the forested areas. These meadows are relatively flat, natural grassy openings near the head and along the course of streams. They are usually surrounded by dense stands of trees. Even though such meadows probably occupy less than 1 percent of the area of northern Idaho and northeastern Washington, they contribute significantly to the total forage resource. Deep fertile soils and ample moisture produce a luxuriant growth of palatable grasses and sedges. Livestock graze here during the summer. These areas can withstand heavy use and are not often badly abused. Some meadows, however, are producing considerably less than their potential, and a few are actively eroding.

Subalpine herblands, like mountain meadows, form only a small part of the range area, yet furnish an important part of the summer forage. These herblands are natural openings on high-elevation slopes and ridges. Areas in good condition produce abundant grasses and forbs, but they are very sensitive to grazing abuse. A combination of high precipitation, unstable soils, fairly steep slopes, and a short growing season with extreme weather variations make proper resource use very difficult. Much of this subalpine grazing type is in various stages of deterioration; soil erosion is prevalent.

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The problems involved in utilizing these five grazing types fall generally into two categories--restoration of deteriorated range and integration of grazing with other land uses. Both kinds of problems relate equally to livestock and big-game range. Detailed descriptions of these grazing types and of the problems involved in grazing management for each are presented in the following pages. Relative severity, or urgency of the problems and research priorities are also discussed. The future of livestock and big-game grazing in northern Idaho and northeastern Washington depends upon satisfactory solution of these problems.

OPEN LOW-ELEVATION GRASSLANDS

The status of low-elevation grassland ranges, in comparison to that of other range types, is an anomaly in several ways. Deterioration on the original vegetation often results in a change to annuals that have a reduced but significant grazing value. The climate, soils, and vegetation under poor range condition do not tend toward severe soil loss by water erosion. In addition, multiple-use considerations are few.

Much of the nearly 2 million acres of this range is in poor to depleted condition. The original vegetation consisted primarily of productive bunchgrasses with an interlacing of perennial forbs. Daubenmire (1942) classified this vegetation into three separate zones. From the most dry to more moist, these zones are: (1) big sagebrush-bluebunch wheatgrass-Sandberg bluegrass, (2) bluebunch wheatgrass-Sandberg bluegrass, and (3) Idaho fescue-bluebunch wheatgrass. Characteristic dominant species in each zone under climatic climax conditions are indicated by the zone name. Additional characteristic species include prairie junegrass, subalpine needlegrass, arrowleaf balsamroot, and silky lupine. When this vegetation is abused by overgrazing, palatable perennials are destroyed; thus, less desirable perennials and annuals are permitted to invade and increase. Severe disturbance often results in establishing an almost complete stand of annuals consisting mostly of cheatgrass brome. Annual fescues and other annual bromes also are often abundant. Such annual grasses still permit considerable grazing. Their major disadvantages, aside from reduced quantity and poorer quality of feed, are large annual fluctuations in production and early drying.

Fortunately, even poor-condition bunchgrass ranges do not suffer depletion of the soil corresponding to that of the vegetation. The limited soil erosion is attributed to the low amount of precipitation (only 15 to 25 inches annually) and fairly good soil cover by invading species. Much of the area is underlain by basalts and is classified as "rough and stony lands" with "incomplete development of soil profiles" (U.S. Dept. Agr., 1936). The deep northern Chernozem soils in the loessial regions of eastern Washington and adjacent portions of western Idaho are now largely in wheat and pea production. The remaining portion occurs in "channeled scablands" to the south

and west of Spokane, and in the foothill and canyon areas of Idaho and Washington. In some places, such as the lower slopes of the Snake and Salmon Rivers in Idaho (fig. 2), the topography is almost precipitous. Although the soils on these steep topographies are remarkably stable with respect to water erosion, they are subject to considerable displacement by trampling.

Figure 2.--Open low-elevation grazing lands along the Salmon River; used primarily in fall-winter-spring period.

Grazing is practically the sole use of these low-elevation range lands, and it will probably remain the only use. Arable lands have already been removed, the area is too arid for timber production, and the low precipitation and relatively stable soils make watershed values insignificant. Big-game use on the area is negligible. Therefore, management can be directed almost exclusively toward livestock production.

Improvement of low-elevation ranges offers opportunity for substantial improvement in the livestock industry. These ranges are badly needed for fall, winter, and especially spring grazing. Adequacy of spring grazing is the limiting factor of many livestock operations. As a result, such ranges are overused and the animals are often forced on the summer ranges too early.

Two different approaches can be used for improvement of low-elevation ranges. Grazing management systems can be used to improve ranges not badly depleted and those not suited to present cultural methods of artificial revegetation because of rocky soils or steep slopes. Some low-elevation ranges could be greatly improved by seeding with adapted introduced grasses. Substantial forage gains and an extension of the grazing period would result. The increased forage produced by seeding suitable depleted areas would open the way to lighter use on other areas and facilitate improvement by proper grazing management.

Forage production could be improved considerably by applying available information. Productive forage species and methods suitable for seeding gently sloping, rock-free ranges are available (Short, 1943; Ensminger et al., 1944; Friedrich, 1947; Hafenrichter et al., 1949; Schwendiman, 1954; Evanko, 1955). Much has been done to determine the general ecology of bunchgrass vegetation found here (Weaver, 1917; Daubenmire, 1942), the reaction of vegetation and soils to grazing (Daubenmire, 1940; Daubenmire and Colwell, 1942; Young, 1943), and plant forms with respect to determinations of utilization (Lommasson and Jensen, 1943; Heady, 1950). The Soil Conservation Service has published a series of range condition classifications for various conservation districts lying within the bunchgrass zone of eastern Washington (Humphrey, 1945; Marsh and Humphrey, 1946; Spencer, 1947a, Gilbert, 1948). Factors to consider in grazing management practices for this type of range are discussed by Anderson (1952). The information contained in these publications and others provides a foundation for developing sound management practices for such range. Unfortunately, full use has not been made of this information.

Research Problems

The current fund of knowledge concerning this grazing type is relatively great, but considerable information is still needed to permit its full development as a range resource. Grazing management techniques for improving the less depleted areas and those unsuited for seeding need to be worked out fully. Detailed grazing management practices are required for forage maintenance on both seeded and naturally improved ranges. This will involve grazing systems, periods, and intensities for different classes of livestock. Information is needed on the relative desirability of maintaining various forage levels. For example, we should seriously consider managing as permanent annual types those ranges that have been converted to annuals but which are not suited to seeding.

Many of the depleted low-elevation ranges cannot be revegetated with high-yielding exotic grasses because of inadequate equipment and methods. Both equipment and techniques need to be developed for seeding rocky soils, rough topography, and steep slopes. The place of fertilization in revegetating these relatively dry range areas needs to be determined. Can fertilizers help in establishment of seedlings, or in boosting production of existing vegetation?

Invasion of undesirable plants is a serious problem on low-elevation ranges. Northeastern Washington and northern Idaho appear to be plagued by an overabundance of exotic range weeds (Noxious Weed Control Task Force, 1952). The most severe and widespread infestation is by common St. Johnswort. More than one-half million acres of rangeland in the northern Idaho and northeastern Washington area are infested by this very aggressive perennial (Harris, 1951). The ecology and control of common St. Johnswort in this area have been reported in some detail (Pringle, 1952; Tisdale et al., 1953; Evanko, 1952, 1953, Nelson, 1956). A wealth of information on chemical and biological control is available from other areas. Biological control by beetles (Chrysolina gemelata and C. hyperici) specific to the plant appears very promising in northern Idaho and northeastern Washington. A problem for future work is determination of management practices to prevent reinvasion of ranges cleared of common St. Johnswort.

Both Dalmatian toadflax and diffuse knapweed are exceedingly aggressive invaders of depleted ranges in this area. Present infestations of these two weeds are small and spotted, but both weeds threaten large range areas. Studies of Dalmatian toadflax and diffuse knapweed have been largely restricted to preliminary determination of effectiveness of various herbicides. Medusahead rye, a Mediterranean annual grass, is a worthless species that reportedly can dominate badly depleted drier sites in portions of Idaho. Ecological studies of Medusahead have been made in Idaho (Sharp and Tisdale, 1952), but little information on control is available. These three weed species severely threaten low-elevation rangelands in this area. As yet, little is known of their ecology or of methods to control them. Their potential spread needs to be determined and suitable direct and indirect control methods developed.

PERMANENT FOREST RANGE

The approximately 3.6 million acres of ponderosa pine lands in northern Idaho and northeastern Washington (Forest Survey Staff, 1937; Buell, 1937; Pissot, 1953) constitute most of the permanent forest range (fig. 3). This relatively open forest type is of prime importance for spring-summer-fall grazing. It occupies the fairly low (1,500 to 3,000 feet) southern and western fringe of forests indicated in figure 1. Demand for spring range has continually subjected these areas to heavy spring grazing pressures. Summer use is alleviated somewhat by availability of later developing summer ranges. Management of this grazing type is greatly complicated by the necessity for integrating grazing, timber production, watersheds, and wildlife production.

The open nature of ponderosa pine forests provides a permanent forage resource in understory vegetation. This is the driest belt of forest in northern Idaho and northeastern Washington (20 to 30 inches annual precipitation), and is dominated only by ponderosa pine. Understory vegetation, however, can be diverse. Daubenmire (1952) classified the climax ponderosa pine zone into four separate associations on the basis of the following characteristic undergrowth species: bluebunch wheatgrass, antelope bitterbrush, common snowberry, and mallow ninebark. Besides these four, prevalent understory species include: Idaho fescue, arrowleaf balsamroot, Spalding rose, and western yarrow.

Figure 3.--Permanent forest range in an open stand of ponderosa pine.

The soils, also diverse, are derived from several parent materials: basalts, granites, aeolian deposits, and glacial deposits in the more northern areas. Much of the land is classified as "rough and stony" (U.S. Dept. Agr., 1936).

More open portions of the adjacent Douglas-fir zone also can be considered a permanent forage resource, especially where a good understory of pine grass is present. However, the overall contribution of this type is very small because its area is small.

Grazing these areas has had an impact upon forage production and upon other land uses as well, but effects of overgrazing a large part of the permanent forest ranges have never been completely evaluated. Abuse of grazing areas has changed species composition to undesirable annuals and perennials. However, the impact of grazing upon timber production has been less apparent. Permanent forest ranges are very important for production of both wood and forage. Overgrazing can markedly affect tree regeneration, and no doubt influences annual increment. On the other hand, grazing capacity has been severely reduced on some areas by overabundance of young conifer regeneration (Harris, 1950). Big game also contribute to the grazing-timber conflicts, for both white tail and mule deer are found in this type the year around. During the winter, elk graze portions of the ponderosa pine zone along the major drainages of northern Idaho. Certain areas are considered critical

game winter ranges; on these and other local areas, deer have considerably damaged ponderosa pine reproduction. Watershed values are important and have suffered under too heavy grazing. Although the erosion potential is not severe, soil loss with watershed depletion does occur. Such multiple-use considerations greatly complicate resource management.

A substantial increase in forage production is possible in this permanent forest range type. Better grazing management practices alone could probably improve this range type considerably. General recommendations for grazing these ranges have been made (Spencer, 1947; McLaughlin and Sundquist, 1948; McLaughlin and Geiger, 1948), but detailed grazing systems for improvement and maintenance are required. Grazing values probably can be increased by such silvicultural practices as thinning; however, logging disturbance can be at least temporarily detrimental to forage production (Garrison and Rummell, 1951). The effects of such practices need to be fully evaluated if they are to be used positively.

Research Problems

The major problem on these forested rangelands appears to be in the integration of grazing and timber production to obtain maximum resource use. Full integration requires a thorough understanding of the effects of grazing upon timber production as well as the effects of silvicultural practices upon forage production. Although several workers have studied the influence of grazing upon forage production on similar ponderosa pine ranges (Pickford and Reid, 1948; Rummell, 1951; Harris, 1954), very little information is available about the effect upon timber production: this is practically a virgin field for study.

The key to full development and proper management of this resource is research. One primary need is a workable formula to answer the economic questions of land use.

What is the relative value of different forested sites for the production of trees, for the production of forage, and for simultaneous production of trees and forage? This is a basic question. The answer will be found in a composite of the answers to many unknowns. A knowledge of land potential for timber and forage production is a first necessity.

What is the effect of grazing by livestock and game on timber stand establishment? What is the effect upon timber increment? This probably involves both soil compaction and the influence upon competing vegetation. And, of course, what are the effects of forest management practices on forage production? No doubt greatest resource values can be obtained from most of the ponderosa pine type by harvest of both forage and timber. It will be necessary to develop compatible grazing systems and silvicultural practices to do this effectively. Answers to the above questions will be needed for the development of such dual management.

TRANSITORY FOREST RANGE

The dense forests of western white pine, grand fir, and associated mesophytic tree species in northern Idaho and northeastern Washington are not ordinarily regarded as forage producers, yet such forests have provided grazing in the past and contain an even greater potential. These dense forests can be grazed only when opened by logging or fire (figs. 4 and 5). An abundance of forage, predominantly browse, is usually produced following opening. Since this production does not persist in the closed timber stands that eventually follow, the grazing values are considered transitory. The total forage resource, however, is considered permanent because logging continually brings new areas into seral vegetation stages suitable for grazing.

Relatively dense forest types constitute much more than half of the total forested areas. The western white pine and associated species type alone covers nearly 4 million acres, while the combined western larch and Douglas-fir types occupy 3.4 million acres, and the lodgepole pine type another 1.3 million acres (Forest Survey Staff, 1937; Buell, 1937; Pissot, 1953). The numerous climax forest associations found here were described in detail by Daubenmire (1952). In most of these, a significant amount of forage is produced only in early seral stages. Closed forest stands are practically useless for livestock and big game. Abundant moisture (25 to 45 inches annual

Figure 4.--Such clear cut and burned white pine areas can produce an abundance of livestock feed before regrowth of the timber stand; however, down logs somewhat hamper grazing.

Figure 5.--A partially cut white pine stand can produce abundant herbaceous growth. Such transitory range might be used for 10 to 15 years.

precipitation) permits luxuriant herbaceous and shrubby growth following tree removal. Generally, herbaceous species predominate only the first few years following clearing. Brush species, such as Scouler willow, redstem ceanothus, Rocky Mountain maple, myrtle pachistima, huckleberry, and many others then dominate the site until tree regeneration crowds them out. Many shrub species are palatable and readily used by sheep and cattle, as well as by elk and deer.

The feasibility of grazing domestic livestock on such areas in the summer has been demonstrated (Young et al., 1942; Ingram, 1931; Lommasson, 1947). These mesophytic forests are usually at higher elevations than the ponderosa pine zone, and vegetal growth begins later. Livestock grazing of the seral vegetation stages has never been very extensive; a much greater potential for grazing appears to exist here than is now being utilized.

Seral vegetation in portions of the mesophytic forest areas play a major role in maintaining the large big-game herds in northern Idaho. South slopes near the river bottoms are vital as winter ranges (figs. 6 and 7). The large deer and elk herds, especially the elk, have built up since the numerous and extensive forest fires in the early part of the century. These early fires, primarily the 1910, 1919, 1926, 1929, 1931, and 1934 burns, created bounteous big-game habitat in the resulting extensive brush fields. Shaw (1954) reported that elk were rarely seen in the Selway drainage of north-central

Figure 6.--Deer and elk winter range along Lochsa River in northern Idaho.

Figure 7.--Such big game winter ranges occur on single or repeated burns. Browse species such as willow and maple often reach heights of 20 feet or more.

Idaho as late as 1913; but by 1935 elk population in this drainage had increased to an estimated 11,000 head. Other herds increased similarly in major drainages of north-central Idaho. As these tremendous brush fields gradually revert to coniferous production or attain heights beyond the reach of animals, progressively less usable range is available. This, combined with reduced fire occurrence and overuse of key wintering areas, has resulted in a general leveling and reduction of animal numbers in many drainages. Examples of such reductions are the decrease of elk in the Selway drainage from 11,000 in 1935 to 7,000 in 1949, and in the Lochsa drainage from an estimated 12,000 in 1936 to 2,100 in 1949 (Shaw, 1954). Maintenance of the big-game resource depends upon provision of a stable habitat commensurate with the number of animals desired.

These mesophytic forest areas can probably contribute more to grazing than is now being realized. Increase of summer livestock use should be possible after development of special grazing practices. Of course the primary value of most of this forest land is for timber production. However, diligent management should enable these areas to support considerable summer grazing without detriment to timber production. Possibly grazing at specific times and intensities might even benefit timber production by assisting in establishment of reproduction (Young, et al., 1942) and by reducing fire hazard (Ingram, 1931). Increased use here not only would provide for more livestock, but also might reduce grazing pressures on other areas now receiving too heavy summer use. The big-game resource would be benefited greatly if wildlife use could be placed in its proper relation with respect to other, often conflicting, uses. Once this recognition is obtained, big-game habitat areas could be so designated, and management of deer and elk could be placed on a sound sustained-yield basis.

Research Problems

Utilization of forage and browse in these mesophytic forest areas presents special problems. In some respects, the conflict between livestock grazing and timber production is not as great here as in the open ponderosa pine type. The high timber producing values plus the transitory nature of grazing should obviate severe conflict--grazing of livestock being purely secondary on such sites. However, if grazing practices can be developed that will not be objectionable to the silviculturist, these forested lands will yield additional return. To capitalize on this forage value, research needs to determine the grazing management required for proper timber development. Maintenance of forage values, per se, need not receive the same consideration here as on the permanent range types. However, methods for livestock distribution need to be developed in order to fully utilize the forage produced.

Forest use by big game often severely conflicts with timber production. Maintenance of this wildlife resource without critical winter range areas devoted almost exclusively to game use does not appear possible. Low-lying, south-slope winter ranges are the limiting factor in determining big-game numbers in this area. Maximum browse is obtained only from seral shrub stages;

therefore, tree growth must be precluded for the most part. However, shelters and means of access provided by adjacent timber stands are a valuable habitat adjunct for elk and mule deer, and they are a necessity for white-tail deer. Criteria are required to facilitate designation of areas where game production should be given preference over other land uses; then decisive action should be taken to so classify these areas and to improve habitat suitability to its best possibility.

Much basic information is required for the development of good management practices for winter range areas. This includes knowledge of the productivity of successional stages for big game and the natural persistence of desirable stages. Development of artificial means for maintaining such stages can then follow. Pengally (1953) found that browse production reached a peak 10 to 15 years following logging, and decreased gradually thereafter until conifers again dominated. However, he studied only a small segment of the problem area. Knowledge of palatability and nutritive value of shrub species precedes determination of productivity; fortunately, considerable information is available on this subject (Young and Robinette, 1939; Pengally, 1953; Woolfolk, 1953). However, little is yet known about the amount of use desirable species can withstand.

The elk winter range problem on the extensive burns in central Idaho is perplexing. Elk demonstrate distinct preference for certain areas and, during years of heavy snowfall, they show extreme reluctance or inability to move to adjacent areas that have more browse available. During occasional severe winters (perhaps one or two out of every ten) animals concentrate on relatively small "critical" ranges. Here utilization becomes extremely heavy and many elk die from starvation. The problem is one of either finding ways to distribute the animals over a larger area during such winters or to provide sufficient browse on the critical ranges to sustain the desired number of animals.

Many key winter range areas urgently need restoration. Remedies for at least three typical conditions of browse deterioration are needed. Many of these areas exemplify one or more of the following problems:

1. On some areas, browse species have grown beyond the reach of game animals. Such species should be restored to usable production.

2. On some deteriorated winter game range areas (chiefly in the ponderosa pine zone), browse has been so seriously suppressed--some patches have been killed--that slopes have been left virtually bare.

3. On still other winter range areas, reproduction of conifers and increase of undesirable species have crowded out valuable browse.

Direct methods of management are needed to restore and maintain key winter ranges at a productive level.

MOUNTAIN MEADOWS

Mountain meadows supply an important part of the summer forage. These grassy, stream-bottom openings occupy not more than 2 percent of the total summer range area, yet provide a significant amount of summer forage. Forage production here is many times greater than on adjacent forested ranges. Reid and Pickford (1946) reported that similar meadows in eastern Oregon and Washington have a potential production equal to 20 percent of the total summer range forage even though they cover only 1 to 2 percent of the summer range area.

Figure 8.--A typical mountain meadow in good condition.

Grassy meadows are scattered throughout the forests of northern Idaho and northeastern Washington (fig. 8). These areas are comparatively flat, natural openings near the head and along the course of streams and are often surrounded by dense stands of trees. Their relatively deep, fertile soils and good moisture relations permit luxuriant herbaceous growth. Perennial grasses and grasslike plants predominate when the meadows are not depleted by overuse. The most prevalent species include Kentucky bluegrass, redtop, tufted hairgrass, and timothy. Sedges and rushes dominate the more moist spots. When subjected to continual heavy use, the soils become compacted and the meadows take on the characteristics of a lawn. Kentucky bluegrass, redtop, and clover then form a dense, low-vigor sod. This sod is broken up

by further depletion, which permits the invasion of such undesirable forbs as western yarrow, common dandelion, cinquefoil, and sheep sorrel. Meadows can withstand a surprising amount of abuse before erosion becomes obvious.

Artificial or induced meadows sometimes form along formerly wooded stream bottoms that have been clear cut, burned, and then heavily grazed. Often the resulting grass-clover sod so dominates these areas that tree reproduction is impeded. Continued grazing enables them to remain essentially a grazing type.

Meadows in northern Idaho and northeastern Washington are not generally badly depleted. Although many are deteriorated vegetatively, most have not begun to erode actively. Deterioration is demonstrated by a change in species composition and reduced production of forage. The threat of severe damage from continued abuse is present, and such damage can be disastrous (fig. 9). Once gullying starts, the water table drops, the habitat becomes drier, and the growth potential is seriously reduced. Damage can be irreparable.

Research Problems

One fundamental requirement for most judicious management of these meadows is knowledge of the vegetal level toward which management should be directed. What species composition, natural or seeded, will continually produce the most pounds of beef and still adequately protect the soil?

Figure 9.--Erosion can be catastrophic on depleted mountain meadows.

Differences in site potential need to be considered. When the most productive levels are known, grazing management systems need to be developed to obtain and maintain the desired kind and quantity of vegetation.

High potential productivity and physiographic suitability make these meadow types well suited for intensive management. However, the details for such management need to be developed.

What restorative practices can increase production on meadows that have deteriorated vegetatively? Studies in Oregon (Pickford and Jackman, 1944) show that seeding to desirable species is possible. Can fertilizers boost production economically in such meadow types? Cooper and Sawyer (1955) found that application of nitrogen and phosphorous to eastern Oregon meadows substantially increased vegetal production. Pocket gopher depredation has been severe in some Oregon meadows (Moore and Reid, 1951), but such rodent activity has not been assessed on northern Idaho and northeastern Washington meadows. Would control yield a significant forage increase here? What are the possibilities of drainage for increasing forage production on very wet meadows? The effectiveness of all these practices needs to be determined.

Figure 10.--Typical subalpine herblands in the Seven Devils Mountains of Idaho. This area is essentially an open sedge-grass-forb type with scattered patches of conifers.

SUBALPINE HERBLANDS

Subalpine herblands, as the name suggests, are natural openings on high elevation slopes and ridges, approximately 5,000 to 7,500 feet elevation, dominated by herbaceous growth (fig. 10). This grazing type occupies a very small portion of the total grazing area in this region but can produce considerable forage during the summer. Unfortunately these ranges are very sensitive to grazing abuse. Their potential productivity, sensitivity to abuse, and importance as key watersheds, give them a significance as problem areas far beyond what their size alone would indicate.

Two different kinds of subalpine ranges apparently occur in this area. Fairly extensive grass-forb slopes are in the southern part, especially in the Seven Devils Mountain region of Idaho, while in northern Idaho and Washington are found more limited openings in which grasses dominate. The relatively balanced mixture of grasses, grasslike plants, and forbs in the more southerly areas includes Idaho fescue, sedges, aster, eriogonum, hawkweed, and western yarrow. In the northern areas, pinegrass, Idaho fescue, green fescue, bluebunch wheatgrass, and sedges predominate; lesser amounts of such forbs as western yarrow, penstemon, and sieversia also occur. Such good condition herblands support an abundance of vegetative growth and provide excellent cover to protect the soil from erosion.

Climate, soils, and physiography all contribute to sensitivity of the vegetation to disturbance and to the erosion potential. Most soils here are of granitic origin and are readily erodible. Heavy runoff from melt of the deep winter snowpack, late spring rains, and occasional high intensity summer storms demand good protection to prevent loss of soil from slopes. The plant growth that provides soil protection must persist under severe growing conditions. The growing season is very short, and temperature variations are extreme. Establishment of reproduction is hampered by rapid drying of soils following snowmelt and spring rains. This combination of weather and soil factors necessitates caution in any land use that tends to disturb either vegetation or soil.

Many subalpine herblands are seriously depleted because they have been grazed too heavily by cattle and sheep during the short summer grazing period. Forage depletion and sheet erosion are evident in many areas; active gullying is severe on others (fig. 11). Such areas now produce only a fraction of their original forage. The most serious result of overgrazing, however, is loss of the basic resource, the soil mantle--which has taken hundreds, if not thousands, of years to form.

Research Problems

Some high elevation openings are so sensitive to disturbance that grazing probably should be excluded entirely. These extremely sensitive areas need to be protected from disturbance to protect their paramount watershed values. Criteria are required to enable delineation of areas that can be grazed safely from those where grazing would result in watershed deterioration.

Figure 11.--Overgrazing of subalpine herblands results in forage depletion and severe loss of soil.

Many of these herblands require restoration. Where soil loss has not been great, a thin but well distributed cover of desirable perennials remains. Some of these areas may be restored simply by using appropriate grazing management practices. Grazing practices (including systems, intensities, and livestock distribution controls) need to be developed for restoration and for maintenance after the areas are restored. Such practices are required for areas still in fair to good condition to prevent possible future degradation. Condition and trend guides established by Pickford and Reid (1942) for subalpine grasslands in northeastern Oregon and southeastern Washington may be useful in management here.

Other areas are in such depleted condition that cessation of grazing probably will not suffice by itself to stop erosion. Such intensive artificial methods as trenching, gully damming, and seeding of soil-holding perennials may be required.

Peterson's (1953) findings regarding suitable forage plants for seeding high altitude range in Montana may be applicable here. The effectiveness of such methods for halting soil loss needs to be determined. In addition, most of the severely depleted areas have undergone a corresponding deterioration in site quality. Consequently, the suitability of various sites to different methods of restoration also needs to be determined. The active state of degradation of much of the subalpine herbland and the irreparable damage through soil loss should spur development of restorative and maintenance practices.

RELATIVE RESEARCH NEEDS

Acreage figures alone do not accurately reflect the grazing values of the various types. On the basis of area, forested lands dominate the grazing types in northern Idaho and northeastern Washington: more than 70 percent of the total area grazed is in forests. Less than 25 percent of the grazing lands are open low-elevation grasslands, and only a few percent are mountain meadow and subalpine herblands combined. However, productivity per acre is much greater on the more lush mountain meadows and subalpine ranges than on the forested and low-elevation grassland ranges.

The bulk of the grazing area is in forests, but the most critical livestock range problems relate to subalpine herblands, many of which are actively eroding. Critical watershed values, high forage potential, and sensitivity to grazing abuse add urgency to solving grazing problems on these ranges and indicate high priority for research. Mountain meadows and low-elevation grasslands lack equivalent urgency for improved management because their soils are more stable even under heavy grazing and because multiple-use conflicts seem less severe. Although major portions of these latter two types are deteriorated and relatively unproductive, erosion is not serious.

Forested ranges appear to be less abused than the other grazing types. However, livestock use here must be integrated not only with watersheds but with timber and wildlife production as well. Development of the transitory range resource might considerably alleviate overgrazing of other summer range areas. Forested areas have a special significance in meeting the habitat requirements of the large herds of elk and deer for which northern Idaho is noted. These animals depend completely upon winter ranges provided by seral shrub stages within the forested zones.

More is known about low-elevation grasslands than about any other grazing type in this area. Less is known that would facilitate livestock management on forested areas and mountain meadows. Very little information is available to help solve the severe problems on subalpine herblands. Thus, for the most urgent problems, we have the least information available.

The contrast in available information is equally great when comparing livestock and big-game use. Lack of specific information about management of big-game habitat is a gross anomaly when we relate the significance of this resource to the economy of the area. The seral shrub game habitat is unique as a problem type. On the other hand, results of studies conducted on livestock range throughout the Northwest and northern Rocky Mountain regions presumably have some application to much of the permanent livestock range in this area. The need for research, then, appears to be more urgent on transitory big-game livestock ranges than on permanent livestock ranges.

One of the greatest needs for research on northern Idaho and northeastern Washington range lands is an adequate ecological understanding of the various range types. Achieving full use of the forage resource and development of

intelligent management practices requires an understanding of the vegetation structure, successional patterns, and species and community responses to grazing pressures. At best, this basic information for most areas is very sketchy. Therefore, synecological studies, including studies of grazing influences, seem to warrant high priority under all types.

A summary listing of major grazing types subdivided into broad problem categories with suggested priorities for research is given below. The two problems considered most urgent for reasons already discussed are restoration of big-game habitat on transitory forest ranges, and restoration of subalpine herbland. The following list of suggested relative priorities does not mean to imply that certain problems are not important: all are important in varying degree.

Major Range Management Problems in
Northern Idaho and Northeastern Washington

Grazing area	Problem category	Research priority
Subalpine herblands:	Restoration practices	1
	Integrated grazing management	2
Transitory forest range:	Restoration of winter range	1
	Integrated grazing management	2
Permanent forest range:	Restoration practices	3
	Integrated grazing management	2
Open low-elevation grasslands:	Restoration practices	3
	Grazing management	4
Mountain meadows:	Restoration practices	3
	Grazing management	4

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A P P E N D I X

Table 1.--Forest and nonforest land in northeastern Washington and northern Idaho

Land Classification	Northeastern Washington[1/]	Northern Idaho[2/]	Total
	Thousand acres		
Total forest	3,930	10,226	14,156
Commercial forest	(3,708)	(7,760)	(11,468)
Noncommercial forest	(222)	(2,466)	(2,688)
Nonforest	4,088	2,341	6,429
Total	8,018	12,567	20,585

1/ Kemp and Pissot, 1949.
2/ Pissot, 1953.

Table 2.--Livestock in northeastern Washington and northern Idaho, 1925, 1935, 1945, 1950, 1954[1/]

Livestock	1925	1935	1945	1950	1954
Cattle					
Northeastern Washington	109,318	77,760	192,092	172,313	214,239
Northern Idaho	77,568	61,176	142,439	117,982	158,717
Total	186,886	138,936	334,531	290,295	372,956
Sheep					
Northeastern Washington	41,655	99,251	72,961	46,145	42,108
Northern Idaho	68,312	86,523	29,290	23,194	27,751
Total	109,967	185,774	102,251	69,339	69,859
Total animal units	208,879	176,091	354,981	304,163	386,928

(= 5 sheep)
(= 1 cow)

1/ U.S. Census of Agriculture, 1925, '35, '45, '50, '54.

Table 3.--Value of livestock in northeastern Washington and northern Idaho in 1954[1/]

Livestock	Northeastern Washington	Northern Idaho	Total
	--- Thousand dollars ---		
Cattle	20,785	15,397	36,182
Sheep	696	480	1,176
Horses and mules	465	432	897
Total	21,946	16,309	38,255

1/ U.S. Census of Agriculture, 1954.

Table 4.--Harvest of deer and elk in northeastern Washington and northern Idaho[1/]

Big game	1952	1953	1954	1955	1956
Deer					
Northeastern Washington	13,769	16,725	14,903	17,441	--
Northern Idaho	5,752	10,581	13,155	10,600	11,800
Total	19,521	27,306	28,058	28,041	--
Elk[2/]					
Northern Idaho	5,207	7,339	8,669	6,001	8,240

1/ Data obtained from correspondence with the State of Washington, Dept. of Game, and the State of Idaho, Fish and Game Dept.

2/ Essentially no elk kill in northeastern Washington.

Table 5.--Land area classification by ownership and type in northern Idaho and northeastern Washington[1/]

Ownership	Total land area	Forest not grazed	Nongrazed farm land	Forest grazed	Non-forest grazed	Total area grazed
	- - - - - - - - - - - - Thousand acres - - - - - - - - - - - -					
Federally owned or managed						
National forest	8,073	6,412	--	1,063	598	1,661
Indian	741	--	--	646	95	741
Other	439	289	--	110	40	150
Total	9,253	6,701		1,819	733	2,552
State and county	1,066	646	--	350	70	420
Private	10,132	1,685	4,218	3,059	1,170	4,229
Total all ownership	20,451	9,032	4,218	5,228	1,973	7,201

1/ Independent compilation by the Spokane office of Intermountain Station. Totals are slightly different from those given in table 1.

COMMON AND SCIENTIFIC PLANT NAMES

Antelope bitterbrush	*Purshia tridentata*
Arrowleaf balsamroot	*Balsamorhiza sagittata*
Aster	*Aster* spp.
Big sagebrush	*Artemisia tridentata*
Bluebunch wheatgrass	*Agropyron spicatum*
Brome	*Bromus* spp.
Cheatgrass brome	*Bromus tectorum*
Cinquefoil	*Potentilla* spp.
Clover	*Trifolium* spp.
Common dandelion	*Taraxacum officinale*
Common snowberry	*Symphoricarpos albus*
Common St. Johnswort	*Hypericum perforatum*
Dalmatian toadflax	*Linaria dalmatica*
Diffuse knapweed	*Centaurea diffusa*
Douglas-fir	*Pseudotsuga menziesii*
Eriogonum	*Eriogonum* spp.
Fescue	*Festuca* spp.
Grand fir	*Abies grandis*
Green fescue	*Festuca viridula*
Hawkweed	*Hieracium* spp.
Idaho fescue	*Festuca idahoensis*
Kentucky bluegrass	*Poa pratensis*
Lodgepole pine	*Pinus contorta*
Mallow ninebark	*Physocarpus malvaceus*
Medusahead rye	*Elymus caput-medusae*
Myrtle pachistima	*Pachistima myrsinites*
Penstemon	*Penstemon* spp.
Pinegrass	*Calamagrostis rubescens*
Ponderosa pine	*Pinus ponderosa*
Prairie junegrass	*Koeleria cristata*
Redstem ceanothus	*Ceanothus sanguineus*
Redtop	*Agrostis alba*
Rocky Mountain maple	*Acer glabrum*
Rush	*Juncus* spp.
Sandburg bluegrass	*Poa secunda*
Scouler willow	*Salix scouleriana*
Sedge	*Carex* spp.
Sheep sorrel	*Rumex acetocella*
Sieversia	*Sieversia* spp.
Silky lupine	*Lupinus sericeus*
Spalding rose	*Rosa spaldingi*
Subalpine needlegrass	*Stipa columbiana*
Timothy	*Phleum pratense*
Tufted hairgrass	*Deschampsia caespitosa*
Western larch	*Larix occidentalis*
Western white pine	*Pinus monticola*
Western yarrow	*Achillea lanulosa*


UNITED STATES
DEPARTMENT
1862
1962
OF AGRICULTURE